Seattle Department of Planning and Development
— formerly the Department of Design, Construction and Land Use

CAM 417

client assistance memo

Sun Chart: Determination of Solar Exposure

March 1999

The Seattle Energy Code allows credit for passive solar gains through glazing in Group R occupancy (residential) spaces if the Systems Analysis (Chapter 4) compliance option is used. (See Seattle DPD Client Assistance Memo #412 for guidelines on using the WATTSUN program for this analysis.) In addition, the Seattle Land Use Code provides certain benefits for solar collectors with good solar exposure. (See Seattle DPD Director's Rule 31-90.)

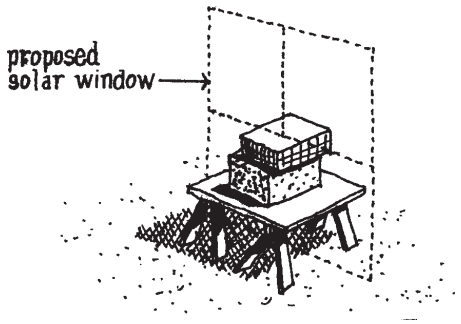
To evaluate and document a proposed window's solar exposure, a sun chart is used (48° north latitude for Seattle). On a sun chart, all objects which could block the sun from reaching the proposed window are shown, as well as the path of the sun on the dates specified. From this information, the number of hours that the window will be in direct sun can be determined.

To complete a sun chart, observations must be made from the actual location of the proposed passive window. The following tools will be required:

- compass } or transit
- protractor }
- a blank sun chart (provided)

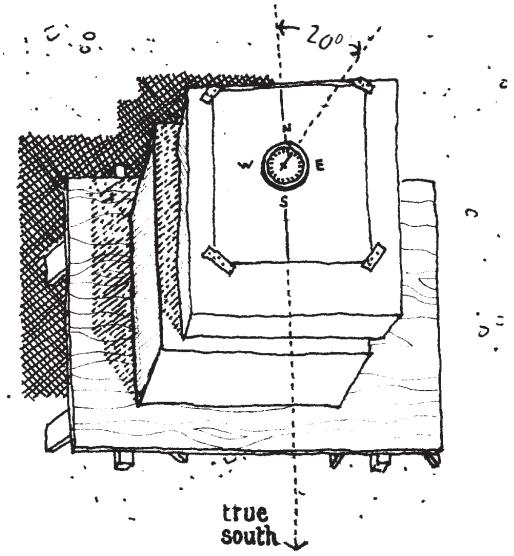
1. Setting Up

The first task is to set up a level surface at the location of the proposed window or group of windows. The surface should be positioned so that it is at the center of where the window or group of windows will be.



2. Orientation

The next step is to establish the direction of true south. This is easiest with a compass where the declination can be set. For other compasses, with the compass lying on the level surface, orient it so that the needle points at 20° east of north. This is to correct for the discrepancy between true north and magnetic north. At this point it is helpful to draw a line, representing the true north-south axis, on a sheet of paper taped to the level surface.



3. Azimuth Angles

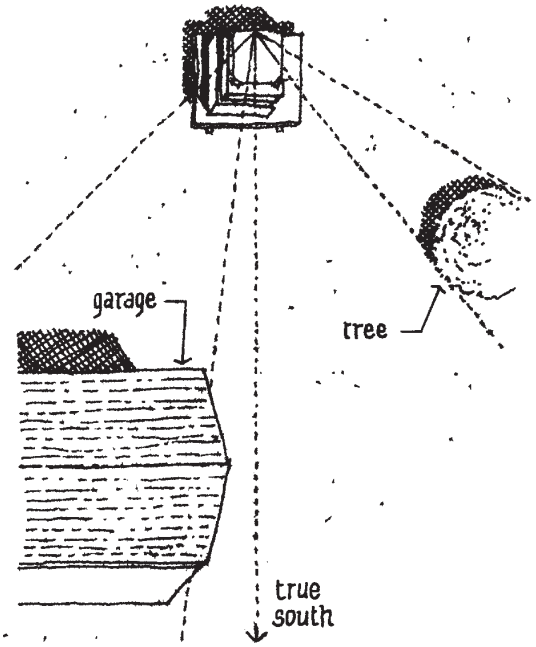
Next, the azimuth angle of each object which may block the sun must be determined. Azimuth angles are measurements in the horizontal plane which represent an angle referenced from true south. To measure the azimuth angles, establish a point-of-vision on the north-south line, at the edge of the sheet as shown. It will be helpful in sighting angles to insert a pin at the point-of-vision. As each object is sighted, draw lines from the point-of-vision representing the edges of the object.

www.seattle.gov/dpd

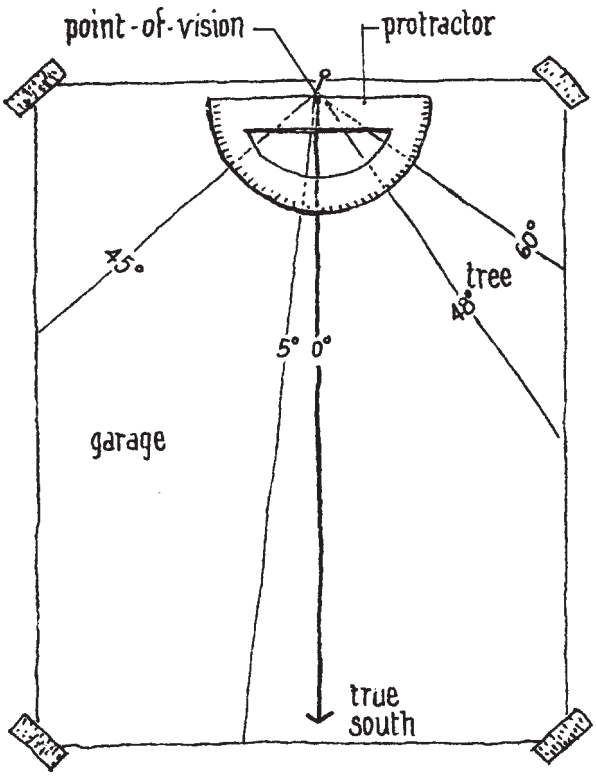
City of Seattle
Department of Planning & Development
Gregory J. Nickels, Mayor Diane Sugimura, Director

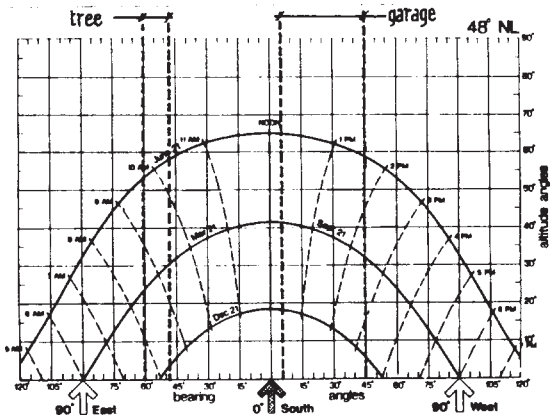
700 5th Avenue, Suite 2000
P.O. Box 34019
Seattle, WA 98124-4019
(206) 684-8600

Example: Azimuth Angles



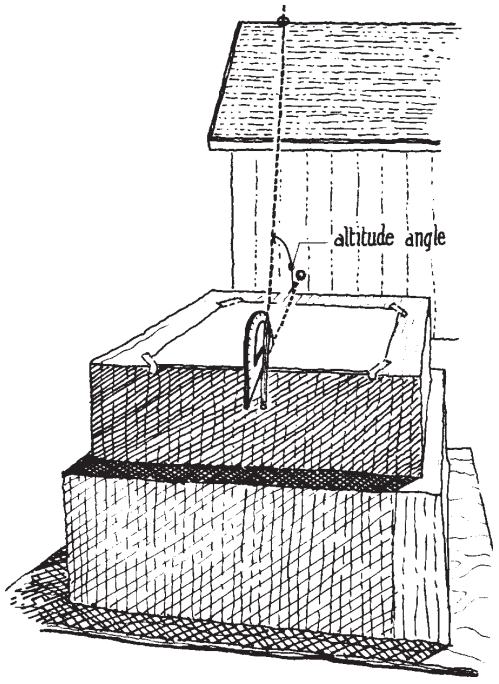
Using a compass or protractor, note the number of degrees away from true south of each line. This information should now be transferred to the sun chart by drawing vertical lines at the angles noted.





4. Altitude Angles

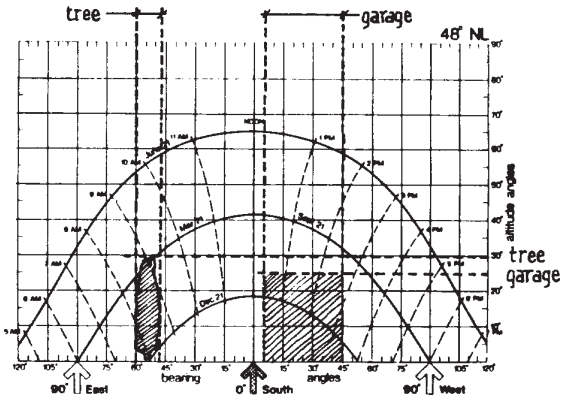
With the azimuth angles established, the next step is to measure the altitude angle of each object. Altitude angles are measurements in the vertical plan which represent an angle above horizontal (level). To measure altitude angles, hold the protractor in an upright position and aim it at each object, sighting along a pencil held against the protractor. The altitude angle can then be read from the protractor where the pencil crosses the scale.



An alternate method of measuring altitude angles is to suspend a weight from a string attached to the reference point of the protractor. With the curved edge down, sight along the flat edge of the protractor. The altitude angle can then be determined from the point at which the string crosses the scale. Subtract 90° from the "string" reading in order to obtain the true altitude angle.

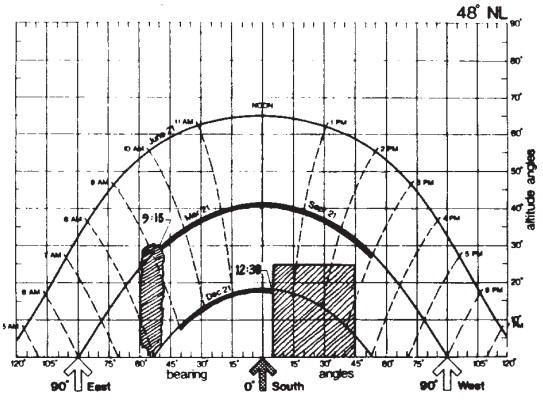
5. Completing the Sun Chart

Using the information obtained in step 4, sketch in the outline or silhouette of each object on the sun chart. Because the sun chart measures angles and not distances, the objects drawn will appear much narrower than they really are.



6. Reading the Sun Chart

With the sun chart complete, the number of hours that the proposed passive solar window will be in direct sun can be determined for various dates. For instance, inputs to the WATTSUN program (see CAM 412) are based on the hours of solar exposure between 9 a.m. and 3 p.m. on December 21. For this example, on December 21st, the window is in sun from 9 a.m. to 12:30 p.m., a total of 3-1/2 hours. Since the window is in sun for less than 4-1/2 of the 6 hours, the building would be modeled as "shaded" in WATTSUN.



7. Documentation to be Submitted

Provide the following with the permit application:

- Completed sun chart indicating the shading by buildings and vegetation, and
- Site plan showing adjacent buildings and vegetation.

8. Further Information

For additional copies of this Client Assistance Memo (CAM) or revised versions of it, contact the Seattle Department of Planning and Development (DPD) at (206) 684-8850. All CAMs are public domain documents and may be freely copied without any special permission.

For projects within the Seattle city limits, further information on Seattle Energy Code requirements is available from the DPD Technical Backup line by calling (206) 684-7846 from 1:00 to 4:15 pm. You may also visit the Energy Code website at **www.seattle.gov/dpd/energy**.

Access to Information

Links to electronic versions of DPD **Client Assistance Memos (CAMs), codes**, and **forms** are available on the "Publications" and "Codes" pages of our website at **www.seattle.gov/dpd.** Paper copies of these documents are available from our Public Resource Center, located on the 20th floor of Seattle Municipal Tower at 700 Fifth Avenue in downtown Seattle, (206) 684-8467.

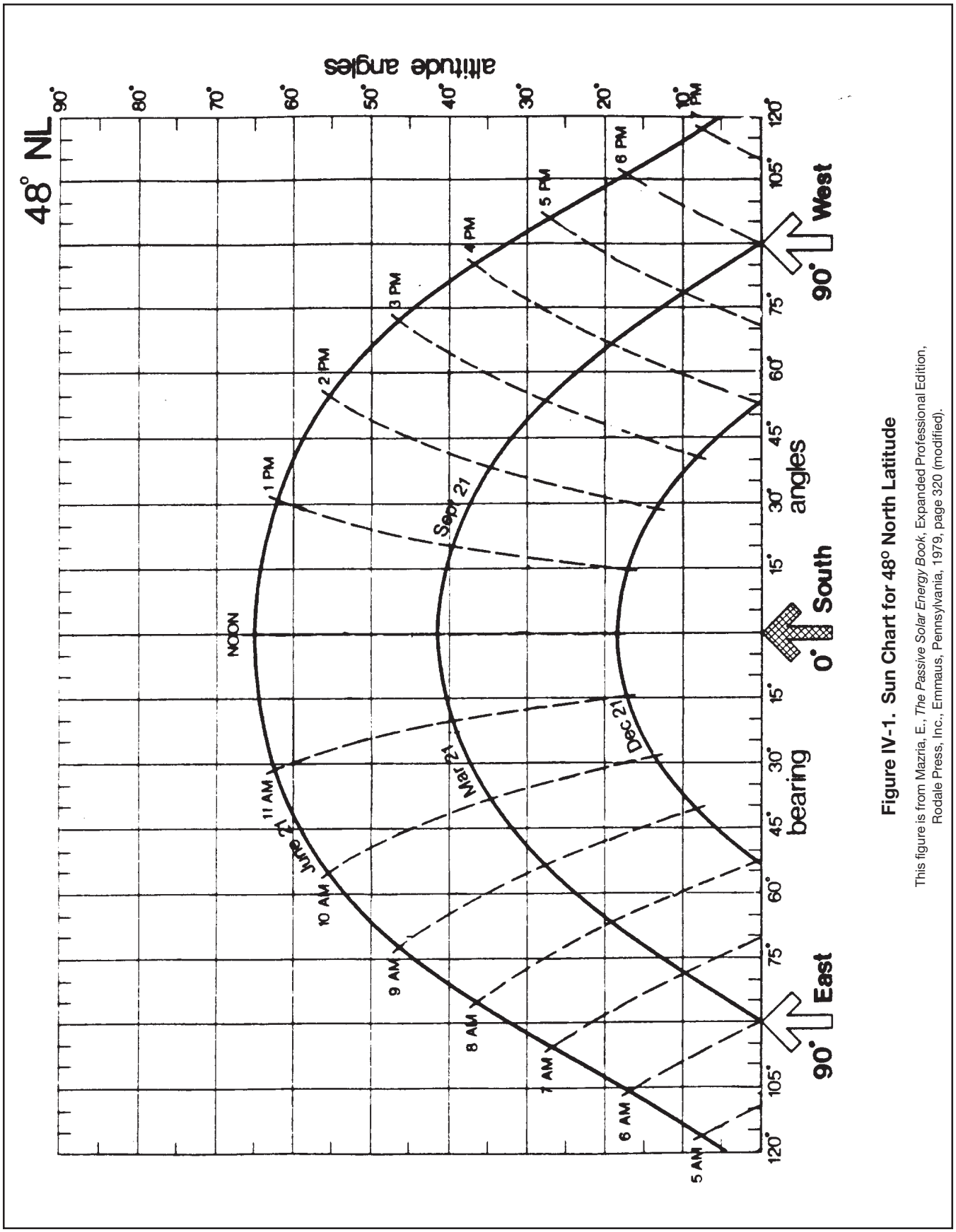


Figure IV-1. Sun Chart for 48° North Latitude

This figure is from Mazria, E., *The Passive Solar Energy Book*, Expanded Professional Edition, Rodale Press, Inc., Emmaus, Pennsylvania, 1979, page 320 (modified).